

Remarks

Applicants respectfully request reconsideration of the above-identified application in view of the present amendment and the following remarks.

Claims 1-11 were pending. By this paper, Applicants have cancelled claim 2, amended claims 3-10, and added new claims 12-16. No new matter has been introduced by virtue of the present amendment. After of this amendment, claims 1 and 3-16 will be pending.

Claims 3-10 were rejected under 35 U.S.C. § 112, second paragraph.¹

Claims 4-10 have been amended to overcome the 35 U.S.C. § 112, second paragraph rejection. Accordingly, Applicant respectfully requests withdrawal of the 35 U.S.C. § 112, second paragraph rejection.

Claim 1 was rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,947,179 to Kinane et al., hereinafter *Kinane*. Applicants respectfully traverse the present rejection.

The present invention provides a method for controlling the manufacture of a spray formed article to achieve stress control by causing metallic phase transformations to assure that plastic yieldable metal phase material, such as bainite, is established by phase transformation control throughout the body of the spray formed article to guarantee that plastic deformation or stretching will occur before cracking or other structural failure in the article. (Specification, paragraph 64.)

¹ While claims 3-10 were rejected because of an apparent misspelling of the word martensite, Applicants respectfully point out that claim 3 does not contain the word martensite. Accordingly, it is respectfully submitted that the Patent Office intended to reject only claims 4-10 under 35 U.S.C. § 112, second paragraph.

Claim 1 recites a method for controlling the manufacture of a spray-formed metallic tool. The method comprises applying a metallic spray-forming material upon a mold substrate in the manufacture of a spray-formed tool, and controlling metallic phase transformations of the spray-forming material via a manipulation of temperature and time maintained at a predetermined temperature of the spray-formed tool during application of the spray-forming material. Controlling the metallic phase transformations further comprises causing the occurrence of preselected phase transformations of the spray-forming material via the manipulation of temperature and time maintained at the predetermined temperature.

The prior art does not disclose, teach or suggest the present invention. Claim 1 specifically recites controlling metallic phase transformations of the spray forming material which further comprises causing the occurrence of preselected phase transformations of the spray forming material. *Kinane* does not disclose, teach or suggest at least these limitations. More specifically, *Kinane* does not teach, disclose or suggest controlling metallic phase transformations which comprises causing the occurrence of preselected phase transformations. As set forth in the specification, the preselected metallic phase transformation result in a substantially homogeneous distribution of commingled metallic phases. (Specification at paragraphs 85 and 88.) *Kinane* does not create a commingling of metallic phases. Instead, *Kinane* discloses creating one of two microstructures - either a coarse bainite or a fine bainite microstructure. (Column 6, lines 3-6.)

Accordingly, *Kinane* does not disclose, teach or suggest every limitation of claim 1. Accordingly Applicant respectfully requests that the 35 U.S.C. § 102(b) rejection of claim 1 in view of *Kinane* be withdrawn.

Claim 1 was also rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,952,056 to Jordan et al., hereinafter *Jordan*, in view of *Kinane*. Applicants respectfully traverse this rejection as well.

Jordan discloses a process for depositing atomized metal onto a substrate in which at least partial solidification occurs followed by further deposition of the partially solidified metal. Finally, the deposited metal is then allowed to completely solidify.

Jordan does not disclose the controlled method of manufacture of a spray formed metallic tool of the present invention. *Jordan* provides a spray forming process in which the deposited steel is cooled (in such a way that martensitic transformation takes place.) (*Jordan*, column 5, lines 8-10.) *Jordan* fails to recognize the particular importance of being able to control the relative amounts of metallic phases. As the specification explains:

The bainite and martensite phases are commingled in the sprayed material, with the bainite lending toughness to the otherwise hard martensite phases or zones. An important aspect of at least one embodiment of the present invention is the capitalization on only the volumetric expansion characteristics of the martensite transformations for stress release but also the institution of an advantageous ratio and commingling of softer and tougher bainite with the harder and more expansive martensite which together accomplish the required stress relief in the spray formed article.

(Specification, paragraph 60.)

The present invention has discovered the importance of being able to manipulate the relative amounts of softer and tougher metallic phase material with harder and more expansive metallic phase material. Accordingly, a wide range of stresses may be relieved by tailoring the relative amount of these phases for particular spray forming application. Moreover, the toughness and hardness of the resulting spray formed article may also be tailored by appropriately adjusting this ratio. It is with this in mind that claim 1 recites that controlling the metallic phase transformation for the composites causing the occurrence of preselected phase transformations of the spray forming material.

Jordan completely fails to recognize this level of control as exemplified by example 5 in which *Jordan* states:

The deposit was also found to be very hard to cut, indicating that a substantial portion of martensite and/or bainite and/or pearlite were present in the final product. In this case the volumetric changes associated with the phase changes occurring during spray deposition were more than sufficient to compensate for thermal contraction stresses in the product, and net compressive stresses were introduced.

(*Jordan*, column 8, lines 39-46.)

This example also illustrates the fact that *Jordan* failed to recognize that commingled metallic phases may be adjusted to control hardness and toughness. *Jordan* groups their effects together.

Kinane fails to provide any of the missing limitations of *Jordan*. The Examiner states that *Kinane* teaches the use of a T-T-T diagram for producing a bainite transformation and that it would have been obvious to one having ordinary skill in the art to provide *Jordan* reheating the substrate to a temperature higher than the martensite start temperature of the spray forming material as taught by *Kinane* in order to effectively control the mixed-phase makeup after a partial rapid cooling and control the quantity of the spray formed tool. Applicant respectfully disagrees with the Examiner's assertion.

Kinane does not disclose the importance of being able to manipulate throughout the amounts of a softer and tougher metallic phase with a harder yet more expansive metallic phase. *Kinane* is completely silent on this limitation. *Kinane* only discloses producing a bainite phase. There would be no motivation for *Jordan* to look to *Kinane* for the teaching the Examiner suggests. Furthermore, even were the reference properly combinable, as the Examiner persists, limitations of claim 1 are still lacking in the resulting improper combination. There is no causing preselected phase transformations in the resulting combination. Accordingly, applicant respectfully submits that the 35 U.S.C. § 103 rejection of claim 1 be withdrawn.

Claims 3-11 all depend either directly or indirectly from claim 1 and are therefore patentable for at least the same reasons as claim 1. Moreover, these claims add further limitations which render them separately patentable.

For instance, claim 4 recites that causing the predetermined strategic volumetric expansion comprises causes preselected phase transformations to a mixed-phase makeup consisting of at least martensite and bainite in predetermined proportions. This limitation is not disclosed, taught or suggested by the prior art.

Claim 4 was rejected under 35 U.S.C. § 103 as being unpatentable over *Kinane* in view of *Jordan*. In addition to being as it depends from claim 1, Applicant respectfully submits that the rejection of claim 4 as being unpatentable over *Kinane* in view of *Jordan* be withdrawn. As set forth above, the present invention is directed to causing a predetermined volumetric expansion by the causing preselected phase transformations. Neither *Jordan* nor *Kinane* are concerned with achieving such a result. *Jordan* does not teach any preselected phase transformations. *Kinane* only teaches producing bainite. Neither would be motivated to the other for teachings on how to make the present invention. Accordingly, Applicant respectfully submits that claim 4 is allowable.

Claim 12 recites a method for controlling the manufacture of a spray-formed metallic article, comprising applying a metallic spray-forming material upon a mold substrate in the manufacture of a spay-formed article, and controlling metallic phase transformations of the spray-forming material via a manipulation of temperature and time maintained at a predetermined temperature of the spray-formed article during application of the spray-forming material wherein controlling the metallic phase transformations further comprises causing the occurrence of preselected phase transformations of the spray-forming material via the manipulation of temperature and time maintained at the predetermined temperature.

Claim 12 recites limitations similar to those of claim 1. The prior art does not teach, disclose or suggest the limitations of claim 1. Accordingly, claim 12 is patentable.

Claims 13-15 all depend either directly or indirectly from claim 12 and are therefore patentable for at least the same reasons as claim 12. Moreover, these claims add further limitations which render them separately patentable.

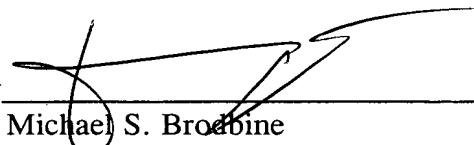
Claim 16 recites limitations similar to those of claims 1 and 4. The prior art does not teach, disclose or suggest the limitations of claim 1. Accordingly, claim 16 is patentable.

Applicants submit that the claims are in a condition for allowance and respectfully request a notice to that effect. If the Examiner believes that a telephone conference will advance the prosecution of this application, such a conference is invited at the convenience of the Examiner.

Applicants have calculated no additional fee to be due in connection with the filing of this Paper. However, the Commissioner is hereby authorized to charge any fee deficiency incurred as a result of the filing of this Paper to the deposit account of Applicants' Assignee, Ford Global Technologies LLC, Deposit Account No. 06-1510. A duplicate copy of this Paper is enclosed for this purpose.

Respectfully submitted,

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